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Editorial

Water and Agriculture: The north-east monsoon is in full swing and with incessant rains and heavy rains at that, one's thoughts naturally turn to "Water". We are at times confronted with too much of this commodity as during monsoons and floods while at other times the scarcity of the same is the limiting factor to our progress. Damages caused by the floods in the entire fertile river valley of the Brahmaputra would still be green in the minds of our readers. Loss to Governmental and private properties have thereby mounted to crores of rupees and in Assam alone the loss recently is reckoned as sixteen crores of rupees, not to speak of the animal and plant life lost in the floods. This is something which needs the attention of both the Agriculturist and the Government. With plenty on the one hand as in times of heavy rainfall and the dearth of the same at other times we have the problems which is common to every housewife, i. e. to conserve in times of plenty for the lean times to follow.

The importance of water to Industry and Agriculture cannot be overemphasized. In Industry, it takes 250 tons of water to make a ton of steel and 25 gallons of water to produce a gallon of aviation petrol. While in Agriculture, a crop of cotton needs 800,000 gallons of water and for lucerne the need is round about 326,000 gallons. Such enormous amounts of water being the requirements in Agriculture and Industry, the water problem has to be tackled first and foremost for the advancement of any country. The United Nations Economic and Social Council in their recent meeting at Geneva have therefore rightly recommended the formation of a "Water Board" in every country to tackle the numerous aspects of water conservation and utilization.

Our Governments have been alive to this important problem and since the Independence have launched out on many projects to conserve the water in times of abundance in huge reservoirs and dams. In the Madras State alone several crores of rupees have been

spent in reservoir projects since 1946. Readers of this Journal would be familiar with the large projects like the Lower Bhavani Project, Malampuzzha reservoir project, Mettur Canal Scheme and the Manimuthar reservoir project. Again, there are also the smaller projects like the Cauvery Delta Drainage Improvement Scheme, the Areniar project in Chingleput, the Walayar and Mangalam reservoir projects in Malabar. The Government of India have given great prominence to the water problem in their "Five Year Plan". Construction of nearly 4,000 tubes wells at an estimated cost of about Rs. 20 crores are fairly under way in the "Five Year Plan", all over India. The tempo of work has since been quickened and a target of 100 wells per month are being sunk. Each well thus sunk is expected to command the irrigation of nearly 400 acres of land.

But the solution of the water problem in Agriculture cannot and should not stop at the governmental level, with the implementation of these vast projects and plans. The farmers of the country have an equal, if not a greater part to play in the solution of this important problem. Prevention of floods and conservation of soil moisture are the age-old problems in which the farmer can help. Denuding of forests and trees in the land should be prevented. More and more trees have to be planted by the farmer to arrest the clouds and induce precipitation in the slack periods of rainfall. Silted up tank beds and other water basins have to be cleared and bunded up to conserve as much, if not all the water received through rains. Soil conservation through proper terracing and planting of grasses, to prevent erosion and to see that water percolates in the soil and drains slowly along water courses, instead of rushing out as floods, are all measures within the orbit of the farmers of the country.

Besides, the farmer can tap his underground water resources fairly cheaply by following the recommendations advocated by the Madras Agricultural Department in sinking filter point tube wells and by pumping up river supplies to high level fields. One thousand and seventy four filter point tube wells and six river pumping sets are now functioning in the Madras State. With the active co-operation of the farmer it should be possible to fully exploit these perennial sources of water supply so that water is no more a bottleneck to our progress in the Agriculture of the Country.

Recent Advances in Mycology and Plant Pathology

by

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The recent advances in Mycology and Plant Pathology are considered separately in view of the differences in their scope and development. The developments in these sciences from the beginning of this century have been considered.

Mycology: At the beginning of the century mycologists were busy collecting and naming the fungi in different countries. Taxonomic studies were concentrated upon and an enormous number of species of fungi has been described from all over the world. This number appears to be steadily increasing and may even outstrip the number of species of flowering plants in course of time. Alongside this development, the method of preservation and maintenance of the specimens also improved. In the beginning of the century the mycological specimens especially plant pathogens were mounted in the same manner as in the case of flowering plants. In many of the specimens so preserved the fungal sori or spores disappeared in course of time due to disturbances in handling specimens and they lost their value later. To avoid such damage, in many of the herbaria the type specimens are now kept in paper folders or covers and these are attached to the mounting boards. In addition permanent slides of the spores and diagrams of these bodies also are being maintained in some herbaria. With the advancement of the taxonomic studies the revision of the systems of classification was suggested by different schools. Phylogenetic systems of classification found favour in preference to the others in vogue.

Besides the collection of fungi, their isolation and study in pure cultures were taken up in earnest. The improvements in cultural technique developed by the bacteriologists were readily adapted by mycologists. Intensive activity on the study of the behaviour of fungi on culture media and the course of development of different types of reproductive bodies, followed. Emphasis was being laid on the phenomenon of sex in fungi. The sex organs readily distinguishable in several Phycomycetes were not clearly evident in the other groups. Harper demonstrated the existence of sex in Ascomycetes. The discovery of heterothallism in Mucoraceae by Blakeslee gave an impetus to investigations on similar lines in other fungi. The elucidation of the nuclear behaviour and the phenomena of

* Paper read at the College Day and Conference, 1954.

mitosis and meiosis enabled the proper appreciation of sexuality in fungi also, especially in the Ascomycetes and Basidiomycetes. The classic work of Craigie on rusts showed the real function of pycnia in the *Uredinales.* Buller's remarkable investigations on diploidisation, Dodge's contributions to the knowledge of the behaviour and inheritance of characters in *Neurospora,* Lindergren's and Subramanian's work on yeasts have all added considerably to our knowledge of the cytology and genetics of higher fungi.

With the acquisition of more precise information of the development of different groups of fungi, attention was focussed on the probable lines of evolutionary progress in this group. The old idea of the Phycomycetes being the lowest of the fungi and the other groups having developed from them gave way to the more rational and modern view of the different classes of fungi having evolved from different groups of lower organisms. The systematists have also realised that fungi are living organisms exhibiting variations and influenced to a large extent by the environment and that consequently the rigidity of the species concept could not be adhered to (especially the type specimen concept) and a certain latitude is necessary in fixing the limits of the species.

With the improvement of the technique of isolation and culture of fungi, more and more attention began to be devoted to the study of the physiology of fungi. The readiness with which the organisms could be grown and the possibility of raising several generations of these organisms in a short period rendered them particularly suitable for these studies. Considerable information on the nutritional requirements of fungi, the enzymes produced by them, the influence of vitamins and other growth regulating substances on their growth and reproduction have accumulated. These physiological and bio-chemical studies have resulted in the development of various industrial processes, utilising these organisms. The fermentation industries utilising different species and strains of yeasts and moulds for different end products, the production of citric acid, gluconic acid, acetone and glycerol by fermentation processes, the manufacture of food yeasts and other yeasts as sources of vitamins, fats and proteïn and manufacture of diastase from *Aspergillus oryzae* are some of the recent developments. The progress of the studies on the nutrition of fungi have resulted in the use of different fungi for the detection of deficiencies of certain micro nutrients in the soil without any laborious chemical analysis (*Aspergillus niger* for zinc, copper and manganese).

During the world war II the most revolutionary development was the discovery of *Penicillin* and *Streptomycin*, bacteriostatic products from *Penicillium notatum*, and *Streptomyces griseus* by Fleming and Florey in England and Waksman in the U. S. A. respectively. This was followed by a feverish rush described as 'mycological rush' comparable to the 'gold rush', for antibiotics. Several hundreds of species of fungi were investigated. However the results were not commensurate with the amount of energy spent. Yet the studies have resulted in giving to the world a few more useful drugs like chloromycetin, aureomycin, terramycin etc. Any way these studies have shown that the ubiquitous moulds in the soil or those that damage our fruits and food stuffs may yield some products useful to man. The early use of these antibiotics was to treat the bacterially induced diseases of man. In more recent times search is being made for antibiotics having antifungal properties also so that they may prove useful in keeping down diseases of plants too. The days of the pure mycologist are numbered. Unless he equips himself with a basic knowledge of biochemistry he will find himself a back number in no time. The investigations on fungi and their activities carried out all over the world are so numerous and so varied that it will be a hard job to keep oneself in touch with all the literature. One may be able to concentrate on particular aspects of the subject alone.

Plant Pathology: In olden days a mycologist and a plant pathologist were understood as being synonymous and we still find in India and often in England also the two terms not clearly distinguished and a plant pathologist often designated a mycologist. A plant pathologist is a plant doctor. In the earlier years most of the known crop diseases were due to fungi and this led to the impression that a mycologist or a plant pathologist were different names with the same meaning. But it is well known at the present day that diseases of plants may be caused by fungi, bacteria, viruses, flowering parasites, deficiency of nutrients etc., and that a knowledge of fungi alone will not be sufficient for a plant pathologist.

Plant pathology as we know at the present day is of recent origin and is only about 60 years old. Diseases of crops caused by fungi had resulted in untold misery and huge financial losses in the last century. The blight of potato, mildews of grapes, rusts of wheat and the rust of coffee in Ceylon are a few of the well known examples. Though the causal organisms were known the measures for combating these diseases did not develop rapidly. The use of

sulphur for combating mildew, the discovery of Bordeaux mixture in France for controlling grape-vine diseases and later the blight of potato and the effect of copper sulphate for seed treatment for the control of bunt of wheat were known. But these had not been widely adopted. The scepticism of the growers, the lack of suitable equipment and local prejudices stood in the way of widespread use of these methods. The impetus to the extended use of chemical fungicides was given by the American Department of Agriculture in the early decades of this century. The chain of agricultural and horticultural research stations established in that country has also contributed to a large volume of literature on plant diseases and their control, emanating from that country. The advances in the control of plant diseases proceeded in different directions viz., in the development of the chemical fungicides, in the breeding of crops with an eye for disease resistance and in the improvement of the equipment for the application of fungicides.

For a very long time the materials used for the control of fungal diseases consisted of compounds of sulphur, copper and mercury. The last group was mainly utilised for seed treatment as it was too poisonous, expensive and toxic for use on foliage. Copper fungicides were employed for the protection of most of the crops and sulphur for the control of the mildews and diseases of orchard crops. Though investigations were being carried out in Europe and America with compounds of various elements these three were the chief elements in use, mainly, on the consideration of cost. The great depression in the early thirties prevented any extension of the plant protection methods. The next development was in the use of organic mercurials synthesised in Germany. This aimed at the reduction of the mercury in the formulations considerably and thus brought down the cost of treatments. Further these could be used as dry seed dressing material which was easier to handle than the steeps or dips recommended earlier. The formulations of sulphur were modified to improve their efficacy. It was found that the smaller the particle size of sulphur used for dusting, the greater the efficacy of the fungicide. This knowledge led to the preparation of finer powders and the use of colloidal and wettable sulphurs. These preparations were good but more expensive.

Bordeaux mixture was the most widely used copper fungicide but its preparation was rather tedious. This stimulated the search for other compounds of copper with equivalent efficiency in controlling diseases. Copper oxychloride and cuprous oxide were used in

different formulations with satisfactory results. The World War II demanded maximisation of food production in all the belligerent countries. Therefore more attention was paid to the control of diseases of all crops. The high prices of raw products which prevailed during and after the war and still continues, enabled the growers to use fungicides freely without being afraid of the expenditure. The urge for the use of fungicides on crop plants like apple and some varieties of grapes which are injured by bordeaux mixture resulted in the testing of various organic compounds besides the usual chemicals. A wide array of such products is now being placed in the market mostly by American chemical concerns like Du Pont, Rohm and Haas, Monsanto and others. These are derivatives of organic sulphur (dithiocarbamates), organic mercury (mertholates), quinone compounds (phygon, spergon) and others. The new fungicides were good for specific purposes but did not serve as wide a range as Bordeaux mixture. But the ease with which they could be prepared and the absence of clogging of nozzles of the sprayers are responsible for making some of them popular.

Side by side with the development of the fungicides improvements in the spraying and dusting equipments were also introduced. The time-consuming operations with small sprayers and dusters are giving way to labour saving applications with mechanically more efficient dusters and sprayers either operated by hand or by power units. The design of the nozzles has also undergone considerable changes and we have now low volume sprayers, high volume sprayers, mist sprayers, swing fog machines, micron sprayers etc., all aiming at reducing the quantity of the fungicide used, wider range of application and quickness of action with no loss in efficiency or coverage of the crops. The principle of atomisation of the liquid by air blast is incorporated in some of these machines. The droplets vary in size from 80 to 100 microns or even smaller. These improvements have enabled the protection of large areas of field and plantation crops in a short time. On this account, one of the greatest difficulties experienced by planters in transporting water or liquids for the preparation of the mixtures in the difficult terrain of the plantations has been eliminated or brought to the minimum. Further, a round of treatment over the entire plantation can be completed in a limited time thus providing adequate and quick protection at critical periods. These operations are also being carried out economically so that expenditure on plant protection is reduced by the use of these modern equipments.

Another line of advance in the control of plant diseases is the evolution of disease resistant varieties and stains of various crop plants. Though it had been recognised in the last century that there were differences between varieties in regard to the damage caused by diseases, it was only after the rediscovery of Mendel's laws of inheritance at the dawn of this century that concerted attempts were initiated to breed resistant varieties. Biffen is to be given the credit of being the first to attempt at hybridisation between resistant and susceptible varieties of wheat to combat yellow rust. His attempts were crowned with success and the variety "Little Joss" was brought into being. Almost simultaneously attempts to overcome the scourge of black rust in Canada, the United States and Australia by breeding for resistance with or without the assistance of the Mendelian theory were initiated by numerous pathologists and breeders. Varying degrees of success were attained. Meanwhile the rusts also began to exhibit differences in their virulence in different tracts. Close study of this phenomenon revealed that new races of rusts exhibiting specialisation on particular varieties were being developed. Eriksson in Sweden and Stakman and his associates in the United States of America showed that *P. graminis* is made up of more than one race. Now over 200 races and biotypes of this rust alone are known each specific on certain varieties of wheat. Thus the race between the breeder and the pathogen came into full swing with success on either side at different periods. Besides the work carried out on wheat, breeding of all crops for resistance to diseases became a normal feature of many of the Agricultural Research Stations all over the world and a large number of resistant varieties in different crops, annuals and perennials have accumulated. However more often these successes have been short lived. In many cases new varieties or races of pathogens exhibiting higher virulence have developed in the meantime capable of infecting the resistant varieties. Thus the fight becomes eternal.

Besides fungi other parasitic organisms like bacteria, have now been known to cause crop diseases. E. F. Smith has the honour of being the pioneer in the study of plant pathogenic bacteria. A large volume of literature has accumulated in all the countries on various bacterial diseases affecting vegetables, fruits and other crops. The blackarm of cotton, the canker of citrus, the brown rot of potatoes and the black leg of tobacco are a few of the common bacterial diseases prevalent in our country. The

control of these diseases is being attempted on the same lines as for diseases caused by fungi.

The most significant development during the period under review is the advance made in the study of virus diseases of plants. More attention came to be given to the virus diseases after the year 1920. The plant virus diseases appear to have spread alarmingly and to have become much more prevalent in the present day. Conflicting theories of the nature of viruses themselves were prevalent for a long time and there was much of wrangling as to whether the viruses were living organisms or only inanimate proteins. The intimate relationship between the viruses and their insect vectors in certain cases was worked out in detail. The dispersal of the viruses through specific insects in certain cases and by a set of insects in others without any specialisation was brought out by the researches carried out in different parts of the world. Pathologists, entomologists and biochemists worked in teams to discover the properties and nature of different viruses. Stanley was able to isolate the tobacco mosaic virus as a crystalline nucleo protein which induced the mosaic when injected back into the healthy tobacco plants. His discovery constituted an important event in the history of virus pathology and this was eagerly seized upon and diligently followed by a group of English workers Bawden, Piere and Bernal amongst others. But still, the controversy whether the viruses are living organisms or chemical entities goes on. There is a school which is of opinion that the viruses are presumably akin to genes. Numerous viruses were being discovered on the different crop plants and these differed from one another in their host range, specificity of insect vectors, physical properties etc. This necessitated their classification in some form or other.

The earlier workers classified the viruses of different plants according to the hosts and the symptoms caused on the hosts like 'Sugarcane mosaic virus'. 'Tobacco mosaic virus' etc. This was followed by the system of classifying the viruses affecting particular genera according to the genus of the host and giving numerals to the different viruses occurring on the same host as 'Solanum virus', I, II. 'Saccharum virus', I, II, etc. Holmes in the United States of America proposed a binomial system of nomenclature for the classification of viruses. This has as its basis the symptom picture produced on the hosts. All mosaic diseases came under the family *Marmoraceae*, and the virus causing mosaic of tobaco was designated

Marmor tabaci. This classification however has not found much support among the other virologists. At the sixth International Congress of Microbiology held in Rome in 1953 the question of the nomenclature of the viruses was considered. It was decided that the use of systems of classification for and the application of binomials to viruses as a whole are undesirable and should be discouraged. (Nature 172, 620. 1954). The discovery of the electron microscope enabled the confirmation of the particulate structure of viruses. This instrument is being put into greater use for furthering the knowledge of the properties of viruses. In spite of all the extent of information available on viruses, the control of virus diseases presents a difficult problem. More reliance is placed on the search for resistant varieties of crop plants. In this attempt more and more use of the wild ancestors of the different crop plants is being made. Vigorous attempts have been in progress in fighting the degeneration (virus) diseases of potato. Stress is laid on the production of disease free seed tubers and their multiplication in isolated areas to replace the seed material in infected localities. The west of Scotland is the source of seed for England and the northern state of Maine for the Southern states of U. S. These places have been chosen because they are often free from insect vectors which help to spread the disease. The tristeza or the quick decline of orange is also attributed to a virus and is threatening the cultivation of oranges in many parts of world. Intense research in the use of different root-stocks, use of nucellar seedlings and adoption of other special horticultural practices like inarching on different root-stocks is being carried out in different continents for overcoming this disease. The swollen shoot of *Cacao* has come into prominence in recent years. It can be confidently stated that almost every agricultural or horticultural crop is affected by one or more virus diseases. Though virus diseases were known from ancient days, (breaking of tulips) more definite information about the nature of the viruses, their transmission and methods of control has accumulated only in recent years. Furthermore the differentiation of the different viruses occurring on crops is being attempted by serological tests. It has been found that when certain plants are affected by a mild form of a virus it is able to resist the infection by more virulent forms. This knowledge has stimulated the trials at immunising perennial plants (fruits) by infecting them with the mild virus. It remains to be seen how far this will become a practical method. A certain amount of success has been achieved. Chemotherapy is being employed to inactivate viruses in perennial plants. By injection of 9-aminobenzene

sulfonamide (0·05%) the virus of X-disease of peach is being inactivated. Thiouracil is reported to act as a viricide.

Following the studies on the physiology and nutrition of higher plants, the influence of various nutrient substances on the intensity of infection by pathoganic organisms were also studied. We know at present, that excess of nitrogen favours the onset of various diseases in several crops. Phosphates are known to keep down infection especially those affecting roots. Balanced application of N. P. & K. are necessary to keep down certain diseases (stemrot of rice). The role of micronutrients both on physiology of fungi and in the control of diseases caused by fungi is under extensive investigation. There are indications that zinc compounds in small doses keep down wilt diseases of cereals and others. Foliage sprays of urea and micronutrient substances are coming into vogue both as a method of supplying nutrition and for the control of certain diseases as root rot and die back of *Citrus.* The influence of manures on the incidence of virus diseases is also receiving greater attention in Europe and America. The attempts to control vascular diseases of plants through chemotheraphy has given success in some cases. The control of toxin-induced Dutch elm disease by the injection and use of 8 hydroxy-quinoline benzoate is a notable instance.

The development of the study of antibiotics produced by various microorganisms has resulted in attempts to utilise this phenomenon for the control of crop diseases. The earliest attempts were directed towards the encouragement of the growth of saprophytic moulds in the soil by the addition of humus or organic matter or green manures. These moulds either by competition or by antagonism helped to keep down the pathogenic organisms and thus reduced the incidence of diseases. The control of the scab of potato by green manuring is a notable example.

Further developments were in the direct use of the antibiotics produced by different fungi for combating crop diseases. However many of them were not fungistatic but only bacteriostatic. Actidione one of the products produced by *Streptomyces* has been reported to be efficient in the control of mildews of peas and beans. Griscofulvin is known to be absorbed by the roots and translocated to different parts of the plant rendering the latter immune from infection by specific pathogens. The antibiotic produced by *Bacillus subtilis* is also claimed to have a similar effect in preventing infection by *Alternaria solani.* These studies are however limited in extent and the adoption of the measures recommended is not within the

reach of many of the cultivators at the present time. However they indicate the possibilities of utilising these products or the direction in which future research may look for suitable fungistatic antibiotics. It may not be possible to obtain such remarkable therapeautic results with these substances on plants as in the case of human beings and animals. At present there is wishful thinking for the development of systemic fungicides. The production of systemic insecticides for the control of pests has stimulated the desiré and search for such fungicides which will, if discovered have a continued effect and will be very effective against root diseases or soil borne infection. There will not be any necessity for repeated applications of fungicides which increase the cost of plant protection. There is however one snag in this. The chemicals that are now applied remain on the surface of the plants and destroy the fungi or bacteria which may come into contact with the coated surface later or the chemical destroys the spores which are on the surface. A systemic fungicide must be able to kill the mycelium growing inside the tissues, without at the same time affecting the host cells. Since the host and the parasite belong to the same vegetable kingdom and not to different groups as in the case of insects and plants the chances of discovering an efficient systemic fungicide are not so readily attainable as in the case of insecticides.

To sum up, during this half century there has been considerable development in the knowledge of life histories of fungi, their cytology and physiology, the factors favouring their parasitism and the host parasite relationship. There has been considerable advance of the knowledge of the nature and transmission of virus diseases a new branch which has been developed only during this period. Remarkable progress is evident in the formulations of the fungicides and in the development of spraying and dusting equipments within the last decade due to the stimulus of World War II. If the same rate of progress is maintained the control of several devastating plant diseases will be rendered easy in the near future. However there are still certain groups of diseases which defy all our attempts to keep them in check as for instance soil borne diseases and root diseases. It is hoped that by the united efforts of the chemist, physiologist, pathologist and the engineer suitable methods of control will be evolved for checking these diseases at an early date.

So far the progress in plant pathology in the world has been considered. Coming to India, sustained interest in plant pathology

as we know it today was taken up only after the appointment of Dr. Butler as the Imperial Mycologist at Pusa in first decade of this century. In the early years he was reconnoitering and collecting informatian on the incidence of various fungi and diseases of crops in the country. He has done remarkable pioneering work and his book 'Fungi and disease in plants' is a standing example of the quality and quantity of work done. Some attempts were made in the selection of rust resistant wheat also at Pusa. With the establishment of agricultural departments in the various States more attention was devoted to the study of diseases of crops in the provinces. Madras and Mysore have excellent records to their credit and several diseases affecting perennial crops like *Areca*, coconut, rubber palmyra and orange were investigated and control measures evolved. In combating rice diseases, Madras has taken the lead and by persistent efforts has given to the cultivator a number of useful strains which could withstand the dreaded blast disease. Mehta's contributions to the study of rusts of wheat in India should be taken note of. After the World War II, the role of plant diseases in reducing production has been recognised by the centre and the states and special plant protection organisations have been started to help the farmer in combating the diseases affecting his crops. All this progress is not enough to meet the problem. This branch of Agricultural Research should be expanded much more. One Pathologist situated in one Institute cannot do justice in the investigation of all the diseases of the multifarious crops grown in the State. In the case of human beings constituting one species, the number of hospitals and doctors attending to the well-being of the people are so many though the number may not be considered adequate for the population. But when the crops are many and each crop has several diseases affecting it and there is little chance of communication between the patient and the doctor regarding the nature of the trouble, the necessity for a number of pathologists to tackle the disease problems of each group of crops in different regions is obvious.

In these days of specialisation it is suggested that we must follow the lead of other countries where agricultural research has advanced considerably and have pathologists for each group of crops like cereals, fruits, vegetables and so on to enable intensive research to be carried out on the various diseases peculiar to each.

The Soil Survey of Bhairavanitippa Project Area— An Irrigation Soil Survey

by

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Introduction: The soil survey of the Bhairavanitippa Project area was undertaken late in 1950 in order to find out the suitability of the soils and water for irrigation. The command area is situated in the Ceded districts of Bellary and Anantapur, far in the interior of the Deccan Peninsula without any high mountains nearby. So the area enjoys a very limited rainfall (about 20 inches per annum) and is subject to famine conditions very frequently. The Tungabadra project which is to be the salvation of the Ceded districts will not confer any benefit on this tract. The only source of irrigation in the region is the river Hagari. This is not a perennial stream and is in floods for only a few days in the year. Still, to improve the tract and to prevent famine conditions, it is proposed to harness the waters of Hagari for irrigation by throwing a dam across it just above the Bhairavanitippa village of Kalyandrug taluk of Anantapur district. The reservoir will have a storage capacity of 2,000 million c. ft. (effective capacity 1500 million c. ft.) and two irrigation channels are proposed to be taken from the reservoir one on either side of the river to irrigate a total area of about 8,000 acres.

2. **Traverse and soil survey:** In order to study the topography and the nature of the soils and to select sites for the profile pits, a traverse of the project area was undertaken. During the traverse the following characteristics were noted: (1) the surface features of the land such as flat, undulating, broken, etc.; (2) the soil-water conditions including drainage; (3) the texture of the soil such as sandy, loamy, clayey etc.; (4) the colour of the soils; (5) the depth, succession and nature of the horizons of the soil profile down to the parent rock and (6) the nature of the cropping and the natural vegetation in the tract.

During the traverse and soil survey on both sides of the river Hagari, 42 profile pits were dug to represent the typical soil types of the area and 112 samples of soil were collected for analysis in the laboratory. These soil samples were cut out from the vertical sides

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of the profile pits dug to the parent rock or the water table. Where the horizons were too deep or indistinguishable, soil samples were drawn for every six inches of the profile. The different horizons or depths of the profile were tested in the field for pH with pH paper, for alkalinity with phenolphthalein and for calcium carbonate with dilute hydrochloric acid. The colour, texture, structure, consistence, organic matter content, root penetration and salt, if any, in the horizons or depths were also noted in the field.

Samples of water from the river which is to be harnessed for irrigation were collected and brought Coimbatore for analysis. Water samples were also collected from some spring channels in the river Hagari and from irrigation tanks in the locality to get some information regarding the nature of the water used at present for raising crops.

The project area: The project area lies on both sides of the river Hagari, 6,000 acres on the left flank in the Rayadrug taluk of Bellary district and 2,000 acres on the right flank in the Kalyandrug taluk of Anantapur district. The slope of the land is generally from the alignment of the main irrigation channel (which is at the highest contour) on either side to the river Hagari. So the river forms the natural drainage channel for the area. The land is in some places uneven and broken and may have to be levelled up before irrigation can be undertaken. However, the larger portion of the tract is only gently undulating to the river. The soil consists mainly of shallow red soil, 6" to 24" in depth and sandy to loamy in texture with patches of deep red soil, black soil and mixed soil. The whole area is thinly populated.

The dry crops of the area are largely groundnut, cholam and cumbu with cotton, varagu, horse-gram etc. to a smaller extent. Under garden conditions ragi is cultivated extensively with occasional raising of tobacco, onions etc. Paddy is the main crop under wet cultivation. The natural vegetation in peromboke lands is Cassia auriculata. The leaves of this plant are used by farmers as green manure for the wetlands. Very little attention seems to be paid to dry land cultivation in the tract and no manures are used. In garden lands, sheep-penning is generally done while paddy lands receive scanty dressings of green leaves.

Geology of the Tract: The rocks of the project area consist of a granite and gneissic complex. The red soils are probably formed

from Potash felspars while the black soils are derived from Soda lime felspars. Kankar is found in all the soil types and gypsum is not present in any profile in appreciable amounts.

Hydrology: There are no wells in the dry lands of the ayacut area. A few, however, have been dug in the mixed soil and black soil areas where garden cultivation is carried on. The water table is low being below 18 ft. in most wells in September.

Drainage: Most of the dry uplands consisting of shallow red soils are porous in the lower depths and have good drainage. The mixed soils and black soils are lower down in the contour but as they have loamy sub soils, water logging is not likely on irrigation.

Erosion: The rainfall in the project area is, on the average, about 20 inches per annum. But the rain is often received as torrential falls and considerable run-off and sheet erosion of soil occur. Gullies found in many places in the tract are evidence of the damage caused.

Soils: The soils of the ayacut area may be divided into 4 groups. These are (1) shallow red soil 6 inches to 24 inches in depth and sandy to gravelly in character. This type forms the major soil of the tract. A large amount of stones of all sizes and shapes are found on the top of the soil. (2) Red soil 3 to 4 feet in depth. This type is sandy to sandy loam in character and occurs in patches on both flanks of the project area. (3) Mixed soils: These are 3 to 4 feet in depth and are found on both sides of the river where irrigation has been carried out with water from the spring channels. They are grey to black in the top 6 to 8 inches and brown to red in the lower depths. The top soil is generally a clay-loam with a loam as the sub soil. (4) Small areas of black soil of depth 3 to 4 feet occur in both the flanks of the ayacut area.

The mixed soils and black soils which have been irrigated with spring channel water from the Hagari have developed alkaline patches in some places.

3. **Laboratory Examination of Soils and Water:** In a survey to find out the irrigability or otherwise of an area, the most important analytical data required are (1) the suitability of the water for irrigation; (2) the salt content of the soil in the different horizons of the profile; (3) the texture of the soil and (4) the drainage facilities of the soil. So all the water samples and all the 112

samples of soil collected during the survey were analysed to obtain the above information. However, to obtain a complete picture of the soil types, one profile pit in each type has also been studied for fertility status, base exchange capacity and exchangeable Calcium. The following estimations were carried out:

(1) Moisture in the air dry soil.

(2) Mechanical composition such as the percentages of Clay, Silt, Fine sand and Coarse sand and the percentage of stones and gravel to fine soil of 2 mm. diameter and below.

(3) Alkalinity studies such as total soluble salts, Carbonates, Bicarbonates, Chlorides and Sulphates of Calcium, Magnesium and of monovalent metals like Sodium.

(4) pH and Conductivity.

(5) Fertility status including loss on ignition, insoluble and soluble mineral matter, total and available phosphoric acid and potash, total nitrogen and calcium.

(6) Base exchange studies consisting of base exchange capacity and exchangeable calcium.

(7) The water samples were analysed for total dissolved salts, carbonates, bicarbonates, chlorides and sulphates of calcium, magnesium and sodium and for pH.

Discussion of the analytical data: *Mechanical Composition*: The shallow red soil which forms the major portion of the ayacut area contains a high percentage of stones and gravel in all depths while the other soil types contain stones and gravel sufficient to prevent water-logging.

The fine soil passing through a 2 mm. sieve has been fractionated into clay, silt, fine-sand and coarse sand according to the International method of analysis. The shallow red soils range from sandy to clay loams, the coarser fractions varying from 50 to 92 per cent. The clay content increases slightly with depth. The mixed soil is mainly a clay loam with a preponderance of coarser fractions. The coarser fractions increase with depth. The deep are mainly sandy red soils loams with over 75 per cent of sand. The mechanical composition of the black soils would put them in the

clay group with over 30 per cent of particles of diameter, 0·002 mm. and less. The soils suspected to be alkaline range from loams to clay soils. They appear to have been formed from mixed and black soils by the accumulation of sodium salts.

The texture of the soils, especially of the shallow red soil which forms the major soil type of the project area is such that drainage will be efficient. Water-logging is not likely on irrigation except in the black soil. This forms only a negligible proportion of the ayacut area and need not be taken into consideration.

Soluble Salts: The total soluble salts are low in the shallow red soils and deep red soils, the amounts being 0·02% to 0·03% and 0·01% to 0·08% respectively. The mixed soils and soils suspected to be alkaline contain fairly high percentages of salts, the value ranging from 0·1% to 0·59%. There is no salt accumulation in any of the profiles studied.

One general feature noted with regard to the soluble salts is that they consist mainly of Sodium (mono-valent) compounds with little or no soluble Calcium salts. There is not much of Sodium Carbonate in the red soil types while Sodium Carbonate and Bicarbonate are present in the mixed and black soils and in the alkaline soils in appreciable amounts. It is a well known fact that a high amount of Sodium salts in the soil is not good for crop production, especially if the Sodium salts exist as Carbonate and Bicarbonate. Judged by the above dictum, the shallow red soils and the deep red soils are good for crop production while the other types are not good.

The pH values of the soils reflect on their soluble salt content and the nature of the salts. Except for a few of the shallow red soils and the deep red soils which have pH values between 7 and 8, all the other soils of the project area are highly alkaline. The soils reported to be alkaline have pH values between 9 and 10. There appears to be a fair amount of Calcium Carbonate in many of the soils. But the high pH induced by Sodium Carbonate and Bicarbonate renders it impossible for the Calcium Carbonate to get into soluble condition.

Base Exchange Studies: The black soil has high base exchange capacities varying from 34 to 57 milliequivalents per 100 gm. of soil. The other soil types are of medium to low base exchange

capacity, the shallow red soil which is the predominent soil type of the area having a base exchange capacity below 10 milli-equivalents.

In the case of a soil having a low base exchange capacity, the entry of Sodium into the exchange complex even in small amounts would constitute an appreciable amount of the total. That is to say, the degree of alkalinisation of the soil would be noticeable with even a small amount of exchangeable Sodium and when the degree of alkalinisation exceeds 30 per cent, the soil would become bad for crop prodution. The shallow red soil which covers about 60% of the ayacut area has a low exchange capacity and irrigation with Hagari water containing sodium salts would bring about its alkalinisation in a few years. To prevent this, organic matter must be incorporated into the soil in adequate amounts. As is well known, organic colloids have 5 to 6 times the base exchange capacity of clay and so will increase the exchange capacity. Moreover, during the decomposition of organic matter, acids are formed and this will lower the pH of the soil and bring into solution Calcium from the Calcium Carbonate of the soil. Organic matter, has also other desirable properties such as binding the loose soil and opening up heavy soils. So the incorporation of heavy doses of organic materials into the soil is advocated when irrigation is given to the soils of the project area.

In the soils of the project area, Calcium appears to be the dominant cation at present. So the soils have now a high lime status. But the picture would be different in a few years' time if Hagari water containing sodium salts is used continuously for irrigation. Gradually the Calcium of the exchange complex would be replaced by the Sodium of the irrigation water and the potentialities of the soil for crop production would become reduced. In a few years' time it would become alkalinised to such an extent that it would be unfit for cultivation. The soil will develop into a typical alkali soil. So, irrigation with Hagari water must be undertaken with caution.

Fertility Status: The soils of the project area are generally of low fertility status. Nitrogen is deficient in all the soil types. There appears to be sufficient amount of total phosphoric acid but available phosphoric acid is in deficit. Potash, both total and available, is present in adequate amounts. Total Calcium is present

in most of the soil types in good amounts, but available Calcium is low. Organic matter also is inadequate in the soils.

pH and Conductivity: The pH of the soil types has already been discussed. There appears to be only slight correlation between the Specific Conductivity values and the total soluble salts present in the soil.

Water: Hagari water taken from different locations in the river and water from the spring channels in the Hagari have been analysed.

The water from the Hagari river and from the spring channels contain considerable amounts of salts and these salts consist mainly of Sodium carbonate, bicarbonate, chloride and sulphate. Calcium and magnesium salts are present only in small amounts. As is well known Sodium Carbonate and bicarbonate are also toxic to plants. Water containing appreciable amounts of sodium salts should not be used for irrigation. The quality of irrigation water may be determined by the salt index formula of A. N. Puri (Irrigation Institute, Punjab). According to him,

Salt Index = (Total Na – 24·5) – " (Total Ca – Ca in Ca CO_3) x 4·85". All quantities refer to parts per 100,000. Salt Index is negative for good waters and positive for those unfit for irrigation. If the water from the river Hagari and the spring channels are tested with this formula, it is found that all of them are unfit for irrigation purposes. With regard to bicarbonates in the irrigation water Wilcox etal (1954) state that Eaton's conception of "residual sodium carbonate" which he defined in 1950 as $(CO_3^{--} + H\,CO_3^{-}) - (Ca^{++} + Mg^{++})$ appears to be useful for classifying irrigation waters having $H\,CO_3^{-}$ in excess of divalent cations. It is concluded that waters containing more than 2·5 me/l of "residual $Na_2\,CO_3$" are not suitable for irrigation while those containing between 1·25 and 2·5 me/l are marginal and that those containing less than 1·25 me/l are probably safe. If Hagari water is measured with this yard-stick, it is found to be unsuitable for irrigation.

Reifenberg (1947) in Palestine has found that fertilizing the soil with potash and phosphatic manures prevents the intake of sodium chloride from saline irrigation waters.

It is also a well established fact that once Sodium enters the exchange complex of the soil, it can be removed only with difficulty

with the use of costly amendments. So the use of Hagari water for irrigation purposes is open to considerable doubt.

4. **Final Conclusions and Recommendations:** From what has been seen of the soil in the field and from the analytical data obtained in the laboratory, it has been concluded that the main soil types of the ayacut area, namely, the shallow and the deep red soils, are suitable for irrigation. But the water which is proposed to be used for irrigation is unsuitable as it contains considerable amounts of Sodium salts.

Under normal circumstances, Hagari water containing appreciable amounts of Sodium salts cannot be recommended for irrigation. But under the peculiar condition obtaining in the project area where the Hagari is the only source of water and where scanty and uncertain rains frequently entail famine conditions, it is to be considered whether the project is to be proceeded with. Fortunately, the major portion of the area consists of shallow red soils with a very low salt content, excellent drainage and a natural gradient towards the river which is very suitable for providing adequate drainage. Another redeeming feature is that the water that will be impounded in the reservoir will be the flood waters of the Hagari and these may not contain so much of salts as the river water in summer which was examined by us. So the project may be proceeded with provided certain precautions and adjustments are undertaken. These are (1) the water should be used judiciouly to avoid possible dangers of water-logging; (2) the drainage system should be adequate and efficient; (3) organic matter must be incorporated into the soil in adequate amounts to build up the base exchange complex of the soil and to bring down the pH. This may be done by growing leguminous green manure crops with the application of phosphate manures and ploughing them in. The green manure seed should be inoculated with the specific bacterium before sowing, (4) salt tolerant varieties of food crops should be grown in the tract such as S. R. 26 B in the case of paddy etc. (5) The soils should be given adequate doses of potash and phosphatic manures to increase fertility and to prevent the intake of sodium salts from the irrigation water.

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Rural Economic Conditions of Coimbatore District

by

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2. STUDY OF HOLDINGS (Condensed from the original report)

Introduction: The term 'holding' merely indicates ownership of agricultural land by any person. In general the greater the number of holdings, the greater is the agricultural backwardness in the sector of agriculture. We are unable to call the holdings in our country as so many farms as is the case in Western countries, because they do not constitute independent units of land areas for planned crop production as it obtains in those countries. The existence of numerous holdings, as they are found at present, is in itself, a sign of unprogressive agriculture, so far as modern standards of agricultural production are concerned. Hence for a rapid and substantial advancement in the industry of agriculture, the nature and implications of a holding as it stands to-day in our country, have to be studied and modified to that extent that each holding shall in future connote independent farming units exactly as they are found in the Western Countries, particularly in the U. S. A.

Method of Study: The details of holdings as they exist in 7 villages situated in the neighbourhood of the College have been gathered for analysis and study. The names of the villages visited in this connection are as follows:— Vadavalli, Komarapalayam, Goundanpalayam, Perur–Chettipalayam, Singanallur, Ganapathy and Alandurai. These villages have been selected more for the convenience of visiting them and for the facilities and confidence for enquiry which it was possible to command in these villages, compared to certain others. So far as size of holdings are concerned, similar conditions exist in all the villages in this taluk, where the system of farming and resources are similar in most respects.

Number and Size of Holdings: It is usual to analyse and prepare statements for giving information on size of holdings, in two ways. One is according to the amount of assessment paid on the holding and the other according to area in acres. In the first statement, showing number according to areas, the preponderance of small sized holdings may be clearly seen, holdings below 5 acres

forming 52% of the total number. These cultivate among them more than half of the area under cultivation, which means such a large area is just on the border of subsistance farming methods and do not have scope for all round improvements in the art of production. The number between 5 to 10 acres is 23% and therefore nearly ¼ of the total. All told, about 75% of the holdings may be considered as sub-marginal, if 10 acres under dry land farming conditions may be said to be the limit for any decent holding. This is also proved by actual enquiries. One important point has to be mentioned, in this connection and that is, even though the area may be less than 10 acres or even 5 acres, if the area is under a well commanded fully by irrigation, the economic aspect completely changes. Such an area with a well gives adequate returns to keep a moderate farming family ordinarily above want. The area actually covered by these wells is less than 25% of the total cultivated area in all the villages and therefore the low economic prosperity of the majority of the holdings can be easily judged from this position.

The average size of a holding for all the villages put together according to area works out to 5·2 acres which is about one acre above the State average. The average size does not bring out the real state of affairs because, if the area under cultivation in the village is large and the number of holdings smaller in number, the average will be higher—eventhough the majority of the holdings are less than the average. It is not safe to be guided by the average, in the matter of holdings because a small holding with a well and intensive cultivation will change the picture completely, from one of poverty to reasonable prosperity whereas a small holding under dry farming conditions will form a drag in the Agricultural economy of the village. Holdings below one acre constitute about 13% but on actual enquiries, we found that nearly 25% of this comprise of house-sites and waste spaces, which do not come under cultivation and therefore such areas are not agriculturally important.

Number According to Amount of Assessment Paid: The average assessment on these lands works out to nearly one rupee per acre, since the amount per acre varies from about annas eight to one rupee eleven annas or so according to the various revenue classification of soils. Hence, similar to the percentages under areas, we find that in this classification, 60% of the holdings are between 1 and 10 rupees assessment group (Statement 2). This indicates that this group includes areas under 10 acres or in other words about 70% are shown to be in this classification also as being under 10 acres. Thus

the majority of the holdings are clearly under the grouping 'sub-marginal holdings' and therefore bring about the evils attendant on small holdings and their management.

Nature and Effects of Sub-Divisioning: The very existence of small holdings is proof of sub-divisioning in the past. The extent of this process of sub-divisioning of holdings can be judged by the percentage increase in the number of holdings from the year of resettlement i. e. 1910 to the current year 1953. The increase has been from 2,355 holdings to 3,059 or nearly 30%. An idea of the 'intensity' of sub-divisioning can be had from statement 3, which shows the number of holdings spread in one or more survey numbers of the field in the village area. Generally holdings which cover more than one survey number may be taken to be the result of more and more sub-divisioning. It is seen that the number decreases as the survey numbers increase. The increase in the survey number has also been due to acquisition or purchase of more area of land in different survey numbers, but this has been found to be to a small extent only, on enquiries made. The sale or purchase of land in all these villages has not been a regular feature and as a matter of fact, the tendency is to hold fast to land owned by every holder in spite of rise in land values.

What are called 'joint pattas' most of them, have been the result of subdivisioning of holdings, and it is a redeeming feature if the members of the family in partitioning have agreed to keep the holding in a joint fashion, without actually splitting for cultivation purposes. The process by subdivisioning of holdings will continue in the same manner as previously, resulting in not only in more holdings, but also smaller units. It is time serious thought is given to this state of affairs and very early action taken to put a stop to further subdivisioning among heirs to a property, by means of suitable legislation. The struggle for existence of a small holder is clearly seen in the different ways in which attempts are made to supplement the income, since the total income from the holding even in a normal season is not adequate to make both ends meet.

Nature and Effects of Fragmentation: Contrary to expectations, the process of fragmentation of holdings has not gone far enough to constitute a problem to be tackled immediately. The average percentage of holdings which have fragmented areas, in all the villages put together is only 8·5 and therefore may be considered

to be very low indeed (as seen from Statement 3). This has been evidently due mainly to the good sense prevailing among the holders themselves, who as far as possible avoid fragmenting of their holdings, by their own mutual adjustments during subdivisioning or at later time. There are many instances of joint cultivation and avoidance of separation of bits in a holding. In certain other areas of the State fragmentation of holdings may be greater particularly in the wetland and intensively cultivated areas of the Deltas. In other States as in Bombay, Uttar Pradesh and Punjab, fragmentation has gone on so badly that it has become a serious handicap to agricultural progress.

It is also important to work out the average fragment per holding and the average area of such fragment. It is these figures which will give us an idea of the extent to which fragmentation has been carried out. For all the villages together the average number of fragments per holding is 2·6 and the average area of each of the fragment is 5·9 acres. So far as number is concerned, (statement 4) comparatively it is not much, but the area has become small enough and any further fragmentation due to subdivisioning in future will result in smaller and smaller bits. The difficulty of working and raising crops on these bits can be clearly judged by a consideration of the distances between the fragments. They are more often situated at distances of ½ to 1½ miles. The average distance between any two may be taken to be a mile. Some are as much as 3 miles apart, located in the two extremes of the village.

General Effects on Economics of Production: The most important points to be discussed in such studies are the direct effects observed on the economics of production on these holdings, as a result of subdivision and fragmentation. Generally, it is easily understood how the smaller the size of a holding the greater the handicaps for improvements in production. But fortunately enquiries in these villages show that the ryots themselves are well aware of such consequences resulting in small holdings and therefore try to avoid as far as possible extreme subdivisioning which cannot be avoided among members of the family, though for a time the land is held in a joint patta, which indicates that there is a desire in the group for some sort of joint cultivation of the land.

Generally, we are apt to overlook one positive advantage in the possession of fragmented plots in different places of the villages. Soils and other physical conditions vary from one locality to another

and in the same village, as for example, lands situated near a river or stream or near a hill or forest area. Such portions situated in favourable localities are preferred and continued to be owned and cultivated for the scope for better or particular crops. The instance of groundnut crop suited to sandy loams nearer jungle areas has been pointed out. Owing to the variation in the nature of soils, different crops could be grown in the different seasons as for example the sowing of cholam is earlier in light soils and that of cotton is late in heavier soils. This is a positive advantage to owner of fragments in that he takes up sowings at different times and gets his income also in the same manner, provided of course, the fragmented plots in themselves are of a reasonable size for independent and economic handling.

The Economic Holding: A study of the holdings is naturally to be concluded with a discussion on the size of an economic holding. Whatever the definition that may be given to economic holding by Economists and others, the most accepted and easily understood conception will be the one that refers to the income from a holding which will keep the average family of the farmer in reasonable standards of comfort according to the locality. At any rate the income must be sufficient to keep the family above want during the whole year, if not enough to save even a little.

On enquiries of several families of farmers it is found that for a normal season and prices an area of 20 acres of dry land would be considered adequate to constitute an economic holding for a family of 4 or 5 members. If a well has been sunk and is able to supply adequate water for growing crops under irrigation, the area could be reduced to 5 under absolutely normal conditions of the season. Statement 5 gives details of expenditure and income on an economic holding suggested, and how the net income meets the requirements of the average farmers' families under conditions of simple standard of living, as obtaining in the locality and under current prices of produce.

Scope for Consolidation of Holding: It is now an established fact that the majority of the holdings in any village, are to be considered as small and uneconomic from the stand point of modern methods of farming. It will be ideal to have holdings which are not less than the economic holding size and also each one is a unit by itself, i. e. without fragmentation. This is an ideal which seems to be unattainable in the near feature, so far as our country is concerned.

However, consolidation of holdings to whatever extent that is possible will be a positive gain in agricultural development. But one has to examine first whether there is any scope for consolidation. It has been stated that the cultivators themselves are certainly aware of the evils of extreme subdivisioning and also of the advantages accruing from large units of holdings which will admit of progressive improvements for increased and efficient production. One is therefore disappointed that on enquiries one has to come to the conclusion that the scope for consolidation of holdings is not much. The owner is very reluctant to part with his portion of land, owing to factors of sentiment and attachment and being content to carry on as under present circumstances without change. But this is not to say that there is absolutely no scope for any work of consolidation. Some success can be achieved by working in a planned manner, slowly and gradually with the willing co-operation of the holders themselves. It may require enough funds for initial advancement to cultivators, who may be willing to part with their lands and which amount neighbouring holder may not be in a position to advance himself. In that way where the parties are willing attempts have to be made for consolidation of such holdings which will bring about the desired result as smoothly as possible. Which agency will move in this matter will be another question. Experiences of co-operative societies for consolidation have not been favourable at all. There should be a more powerful or rather influential body, than a co-operative society, which should come into the field. It is the Government alone that is capable of achieving any tangible results and that is why probably the Uttar Pradesh Government have taken up the matter in their hands on an all State basis recently. The next best agency would be the Village Panchayat Boards when they are properly settled for working in the villages. But they will also require proper Governmental support and guidance from revenue and agricultural officers as and when they move in this matter with enthusiasm and commendable enterprise.

Conclusion and Recommendations: 1. There is no record or register maintained by the village officers which show directly the number of subdivisions in a holding or the number of fragments. The information has to be gatherd on enquiry and given from the experience and knowledge of the Karnam or other people. It may be necessary to keep proper records to show clearly these two aspects of holdings in the villages.

2. As a result of continued gradual subdivisioning in the past, holdings have definitely become small and uneconomic, the average size being 5·16 (dry lands). This process if allowed to continue, will result in further reduction in size. A suitable Act preventing further subdivisioning has to be passed as early as possible.

3. Fragmentation has not been carried out to any serious extent, as it is only about 8% of the total holdings in the villages. But this will continue to increase, if subdivisioning is not checked. The average number of fragments per fragmented holding is 2·6, which can be considered low enough, compared to other States.

4. Voluntary adjustments of fragments are rare, but neighbouring cultivators take on lease adjacent areas for convenience and efficiency of cultivation. This has to be fully encouraged in the interests of proper land utilisation.

5. Enlargement of holdings to the limits of economic holding size, by persuasion and encouragement could be more successful in the long run, than other schemes of orthodox methods of consolidation of holdings.

6. Distances between fragmented plots are not considered a serious handicap as the plots are within reasonable distance in the village itself and due to the variations in soils and locality conferring benefits to one over the other, the advantages of fragmentation in some cases over-weigh the supposed disadvantages in the cultivation of these plots.

7. There is no voluntary effort at consolidation of holdings and the enthusiasm for such a process is practically absent among the holders. Most are just satisfied with the existing conditions and willing to carry on as at present. But in the interest of future development of agriculture and improvement as unit farms as in the west, efforts have to be made by Government to improve the position by gradual method of consolidation.

8. The size or area of an economic holding may be fixed at 20 acres for the dry lands under normal seasonal conditions, and 5 acres for a garden having well with fairly assured supply of water. It must be noted that the area of an economic holding for the dry land will increase proportionately according to the degree of failure of the seasonal rains in any year, assuming that prices of produce do not have great fluctuations from season to season.

STATEMENT No. 1.
Number of Holdings according to size in acres

S. No.	Village	Below one acre	1—3	3—5	5—10	10—15	15—25	25—50	50—100	100—250	Total	Total area of Holding	Average Holding
1.	Alandurai ..	50	146	139	169	43	44	27	8	1	617	4027	6·52
2.	Ganapathi ..	29	40	51	95	32	10	..	2	..	259	1632	6·33
3.	Kavundampalayam ..	32	119	88	82	19	12	5	..	..	357	1710	4·80
4.	Komarapalayam ..	71	121	80	48	14	6	..	..	..	340	1123	3·30
5.	Perur-Chettipalayam ..	48	87	119	128	37	8	10	1	..	438	2480	5·70
6.	Singanallur ..	51	124	64	76	24	6	11	..	..	355	2300	6·50
7.	Vadavalli ..	128	232	178	190	19	12	5	..	..	693	2510	3·60
	Total ..	409	869	719	717	188	88	58	11	1	3059	15782	5·16 (average)
	Percentage ..	13	28	24	23	6	4	2	..	..			

STATEMENT No. 2.
Number of holdings according to amount of Land Revenue paid

S. No.	Village	During Resettlement 1910							During 1953						
		Below Re. 1	1—10	10—30	30—50	50—100	100—250	Total	Below Re. 1	1—10	10—30	30—50	50—100	100—250	Total
1.	Alandurai ..	14	305	83	10	2	..	414	90	440	70	13	4	..	617
2.	Ganapathi ..	26	55	100	22	5	2	210	25	93	123	15	2	1	259
3.	Kavundampalayam ..	10	190	59	7	5	1	272	19	259	71	7	1	..	357
4.	Komarapalayam ..	32	51	110	55	37	11	296	32	72	134	56	35	11	340
5.	Perur-Chettipalayam ..	21	268	44	1	..	..	334	59	328	43	7	1	..	438
6.	Singanallur ..	40	185	57	10	9	7	308	29	202	78	26	14	6	355
7.	Vadavalli ..	68	358	88	5	2	..	521	124	499	67	3	..	..	693
	Total ...	211	1412	541	110	60	21	2355	378	1893	586	127	57	18	3059
	Percentage ..	9	60	23	4·5	2·5	1	..	12	62	19	4	2	6	

STATEMENT No. 3.

Number and distribution of fragments in Holdings

S. No.	Village	Fragments 2	3	4	5	6	7	Total	Total area	Average size of fragments	Total No. fragmented holdings	Total No. of holdings in the village	% of fragmented holdings	No. of fragments per holdings
1.	Alandurai ..	30	17	5	2	1	1	194	1746·81	9·00	76	617	12	2·5
2.	Ganapathi ..	20	5	..	..	..	..	55	368·76	6·70	25	259	9	2·2
3.	Kavundampalayam ..	25	7	1	1	..	..	80	413·39	5·17	34	357	9·5	2·4
4.	Komarapalayam ..	8	4	4	6	3	..	92	184·35	2·12	25	340	7	3·7
5.	Perur-Chettipalayam ..	19	1	1	2	..	..	55	449·27	8·17	23	438	5	2·4
6.	Singanallur ..	15	4	3	1	..	..	59	335·75	5·88	23	355	6·5	2·6
7.	Vadavalli ..	39	11	4	1	1	1	145	579·39	3·58	57	693	8	2·6
	Total ..							680	4018	..	263	3059	8·5 (average)	2·6 (average)

STATEMENT No. 4.

Areas of fragmented holdings according to sizes for all villages

	Acre crops 0—5	5—15	15—25	25—50	50 and above	
Total area of fragmented holdings in each group ..	151	1205	776	1140	748	4018 (acres)
Number of fragments ..	98	309	126	110	37	680
Average area per fragment ..	1·54	3·91	6·16	10·37	20·22	
Total number of fragments ..						263
Average area per fragment for all the group ..						5·9 acres

STATEMENT No. 5.

Size of an Economic Holding – Coimbatore Taluk – from Expenditure and Income Statement for one year (Based on prices Prevailing in September 1954 and under Normal Seasonal Conditions.)

Dry Land (Rainfed) 20 Acres

Crops – Cholam Mixed with Pulses

Expenditure :

Cost of Cultivation for 20 Acres at Rs. 75/- per acre ..	Rs.	1,500/-
Land Revenue at Rs. 1—8—0 per acre ..	,,	30/-
Interest and ohter charges ..	,,	50/-
	Rs.	1,580/-

Receipts :

60 Salagais Cholam grain at Rs. 25/- per Salagai ..	Rs.	1,500/-
Value of Straw 40 Cartloads @ Rs. 15/- per cartload ..	,,	600/-
Value of Pulses at Rs. 20/- per acre ..	,,	400/-
	Rs.	2,500/-

Net Income Rs. 2,500/- — Rs. 1580/- = Rs. 920/-

Garden Land (with well) 5 acres

Crops :

Cholam ..	2 Acres	Area of Well, yard etc., ½ Acre
Ragi ..	2 ,,	
Cambodia Cotton ..	4 ,,	
Vegetables etc. ..	½ ,,	

Expenditure :

Cost of Cultivation :—

Cholam ..	Rs.	270/-
Ragi ..	,,	270/-
Cotton ..	,,	900/-
Vegetables etc. ..	,,	50/-
Land Revenue @ Rs. 2/- per acre ..	,,	10/-
Interest & other charges ..	,,	100/-
	Rs.	1,600/-

Receipts :

Cotton 16 Pothis @ Rs. 115/- ..	Rs.	1,840/-
Cholam 12 Salagai @ Rs. 20/- ..	,,	300/-
Ragi 12 Salagai @ Rs. 20/- ..	,,	240/-
Vegetables etc ..	,,	50/-
Value of Straw-Cholam ..	,,	100/-
Value of Straw-Ragi ..	,,	50/-
	Rs.	2,580/-

Net Income Rs. 2,580/- — Rs. 1,600/- = Rs. 980/-

Note:— Net income of about Rs. 950/- per annum is assumed to be sufficient for a family of 3 adults and 2 children under ordinary rural conditions of living.

OBITUARY

RAO BAHADUR C. TADULINGA MUDALIAR

Retired Principal, Agricultural College, Coimbatore

Ex-Mayor of Madras Corporation

MADRAS

The news of the death of Dewan Bahadur C. Tadulinga Mudaliar, former Systematic Botanist first and Principal of the Agricultural College next, at Madras on Wednesday, the 13th October 1954 must have plunged into sorrow many of his colleagues, students, members of the Union and a considerable part of the population in Madras. Mr Mudaliar entered the Agricultural department in 1901 and retired in 1933 after putting in a long, meritorious and strenous service of 32 years. He lived upto a fairly ripe age of seven decades and a half.

Sri Tadulingam was born in October 1878, in Madras in a noble family, his brother being the late Dr. C. Natesa Mudaliar. Mr. Mudaliar distinguished himself as a clever botanist by winning the first place in the B. A. Degree Examination of the Madras University in 1900. He had the good fortune to get his training under no less a person than the famous biologist Dr (later Sir) Alfred Bourne, F. R. S., and thus grew up to be an eminent Systematic Botanist. The Madras State Herbarium attached to the Agricultural College and Research Institute, Coimbatore owes a deep debt of gratitude to Sri Tadulingam who, along with the late Rangachari, built it up to its present magnificent level. Sri Tadulingam was also a popular teacher all through his service and was very much loved by one and all of his students for all the qualities of his head and heart.

Sri Tadulingam was made the Principal of the College, a post which was rarely given to an Indian in those days and he retired as Principal in 1933 as one of the most popular officers of the Department. Sri Tadulingam was a Samaritan, to use the biblical expression, and there was not a soul in the College Estate, irrespective of cast or creed, or place, high or low, in the official strata, who had not enjoyed his timely help in moments of dire need. His ear and his purse were available at all times to anybody and everybody who badly needed them. A born good soul, with always a benign smile on his face, he was never known to be harsh even to his erring subordinates. After his retirement, Sri Mudaliar took a lively interest in the civic affairs of Madras City. He served as Councillor for the Chepauk division for 15 years. He was elected as Mayor in 1942. He was the President of the Co-operative Milk Supply Union, Ayyanavaram. Being of a pious disposition, he took an active part in the management and conduct of the affairs of the Ganesa Temple in the Big Street, Triplicane. Sri Tadulingam will ever be remembered for his services to the botanical world and for his golden heart.

To the surviving relations of Tadulingam's family, the Union conveys its heartfelt condolences.

May his soul rest in peace.

(S. N. C.)

Research Note

Achroia Innotata Lankella C. & T., — A New Wax-Moth Recorded in South India

Two kinds of wax-moths were, so far, recorded in South India and their bionomics and control measures have been studied in detail. One is the greater wax-moth—*Galleria mellonella*, F—the most serious pest of the honey bees and the other, the lesser wax-moth—*Achroia grisella*, F—which is almost similar to Galleria in habits, but the caterpillars are more scavengers, feeding on the debris collected on the floor-boards of bee hives.

Recently, a few moths reared out from the infested combs collected from colonies kept at Kotagiri and Burliar, on the Nilgiris, appeared to be different from the above two and were identified as *Achoria innotata lankella* C. & T., by Dr. W. H. T. Tams, British Museum (Natural History), Cromwell Road, London. A description of this new wax-moth is given in "The Entomologist" Volume LXXVI, February 1943 No. 957. So far as the status of this pest is concerned, the caterpillars are noted both inside the combs and on floor-boards of working colonies. Colonies of the dark variety of the Indian Bee—*Apis indica* F—seem to be more susceptible to the attack of this pest. Studies on the binomics of this new enemy have been taken up at the Apiary, Coimbatore.

Agricultural College, Coimbatore

V. MAHADEVAN,
Assistant in Entomology.

ABSTRACTS

1. *Pigman, W. and Finn S. B. (University of Alabama, Dental School and Medical College, Birmingham) "Attack on Dental caries" Chem and Eng. News, Vol. 32 P. 1658, 1954.*

Dentifrice which will prevent dental decay has yet to be found. Ammonia, urea and chlorophyl for which exaggerated claims have been made, have since been found to be unjustified. Among the "antienzymes" the compounds dehydroacetic acid, N-lauroyl-N-methyl-glycine and related compounds show promise. Fluorides used either topically or systemically still remain the only generally recognised practical anticaries agent. [A. M. K.]

2. *Radley J. A. "Potatoes as a crop and as an Industrial raw material" Chemistry and Industry No. 3, Page 64. January, 16. 1954.*

Prepared foods made from potatoes may be divided roughly into three groups, potato flour for indirect human food, potato flakes or cosettes for animal food and dehydrated mashed or strip potato.

Potato flour has been claimed to be more efficient than wheat flour as a dusting agent to prevent adhesion to boards etc., to have better filming properties and to impart a more favourable crust to the loaf.

Dehydrated mashed potatoes: Potatoes normally used in this work are of the non-waxy type. [A. M. K.]

3. *Verghese, E. J.* "*Manuring the coconut*" *Bull. Indian Central Coconut Committee Vol. VII No. 5 P. 157. 1953.*

Schedule of manuring (West Coast). (1) With the receipt of pre-monsoon showers in April—May, apply mineral fertiliser to supply 0·25 lb. N. 0·5 lb. P205 and 0·75 lb. K20 per tree. Seeds of a green manure plant at 20 to 25 lb. per acre are then broadcasted and covered with a light plough: (2) After maximum grouth of green manure plant, bury under by ploughing: (3) Along with green manure apply fertilisers to supply 0·25 lb. N, 0·5 lb. P205 and 0·75 lb. K20 per palm. (4) Repeat 1, 2, 3, every year. [A. M. K.]

Scientific Disagreement over Smoking and Lung Cancer

	Opinion of ERNEST L. WYNDER, Sloan-Kettering Institute, U. S. A.:	Opinion of W. C. HUEPER, National Cancer Institute, U. S. A.:
What causes lung cancer?	Cigarette smoking is the most important single external environmental factor causing lung cancer.	There is little if any medical evidence advanced in support of the cigarette theory.
Why the difference between urban and farm rates?	Greater incidence of lung cancer in urban populations than in rural parallels greater cigarette consumption in cities.	The recent alarming rise in frequency, especially among males, is causally related to local and general development of modern industry and the use of its products.
Why the different rates in different countries?	Death rates from lung cancer have increased in countries where tobacco consumption has greatly increased, and have not in countries (Iceland, for example) where consumption has not increased.	Discrepancies in incidence rates for various areas reflect differences in general types of atmospheric exposures.
Why is lung cancer more common in men than women?	Lung cancer has increased more among men, who are more frequently long term, heavy smokers, than among women. The slight increase in lung cancer among women parallels the gradual increase in smoking by women.	Effects of varying local exposures can be obliterated in the usual type of statistical data prepared for states and countries, and for different sexes and age groups.
What of the experimental evidence?	Epidermoid cancer of the skin in animals has been produced by application of cigarette smoke condensate.	The best that can be said about the experimental evidence on hand is that it indicates presence of carcinogenic agents in cigarette tar through use of hyperreactive animals.

—*Chem. and Eng. News, Vol. 32, p. 3124, 1954.* (A. M. K.)

LAUGH OR LEARN

How to Succeed Without Talent

If we are to believe everything we hear, how to succeed without talent is a widely practiced art. For those not completely in the know we attach the following check list which is offered by Harold R. Nissley, Cleveland, Ohio.

* Study to look tremendously important.

* Speak with great assurance but stick closely to generally accepted facts.

* Avoid argument. But if challenged, fire an irrelevant question at your antagonist and intently polish your glasses while he tries to answer. (If you don't wear glasses, hum under your breath while examining your finger nails)

* Contrive to mingle with important people.

* Before talking with a man you wish to impress, ferret out his remedies for local, national, and international problems. Then advocate them vehemently.

* Listen while others wrangle. Pluck out a platitude and defend it fervently.

* When asked a question by a subordinate, give him a "Have you lost your mind?" stare until he glances downward. Then paraphrase the question and fire it right back at him.

* Acquire a capable stooge but keep him in the background.

* In offering to perform a service, imply your complete familiarity with the task. Then give it to the stooge.

* Arrange to be clearing house for all complaints. It encourages the thought that you are in control and enables you to keep the stooge in place.

* Never acknowledge thanks for your attention. This will incubate sub-conscious obligations in the mind of your victim.

* Carry yourself in a grand manner. Refer to your associates as "some of the boys in our office." Discourage light conversation that might bridge the gaps between boss and man.

* Walk swiftly from place to place as if engrossed in affairs of great moment. Keep your office door closed. Interview by appointment only. Give orders by memoranda. Remember, you are big shot and you don't care who knows it.

— Chem. and Eng. News, Vol. 38, 2848, 1954. (A. M. K.)

GLEANINGS

Use for Chicken Feathers: A fiber made from chicken feathers can be used as a paint brush and is claimed to be virtually identical with chinese hog bristles. The new fiber is based on keratin extracted from chicken feathers by chemical means. This is then converted into bristles following the same procedure as in other man-made fibers. Chem. and Eng. News, Vol. 32, Page 2,110, 1954 (A. M. K.)

USDA Studies on D. D. T. Carry Over in Soils: Toxic residues left in the soil from the D.D.T. applied was about the same after eight years whatever be the amount of D.D.T. applied. Average carry over in turf was 92% after two year, 43% after four years, 36% after six years and 29% after seven years. This percentage was the same whether 25 or 50 lbs. D.D.T. was applied to the soil. Chem. and Eng. News, Vol. 30, P. 3066, 1952 (A. M. K)

Chemical Extenders to Insecticidal Sprays: D.D.T. when applied as an oil-base spray is not long lasting on foliage as the oil penetrates into the foliage. If Instead of oil, a highly volatile solvent as methyl-ethyl ketone is used as chemical extenders for the insecticide, it quickly evaporates leaving a residue of the insecticide. The effect was lasting for 60 days while it lasted only for 15 days with the D.D.T. oil solution. Chem. and Eng. News, Vol. 32, Page 3259, 1954 (A. M. K.)

State Insurance Scheme to Benefit Workers: For the present the scheme aims at providing some sense of economic security to workers in the case of three contingencies, namely sickness, maturity and industrial injuries. The scheme would provide five types of benefits, medical care benefits, sickness cash benefit, maternity cash benefit, disablement cash benefit and dependants' cash benefit.

The Employees' State Insurance Corporation had been making every possible effort to complete enforcing the scheme everywhere, to apply to industrial workers which now has already covered roughly two lakh employees in Delhi, Kanpur, Punjab and Nagpur and now recently inaugurated in Bombay. Funds for the scheme would be mainly derived from contributions made by employers and employees. The scheme is a very big social security venture for the first time in independant India. [Press reports.] (A. H. S.)

The Fat Problem: The rapidly growing importance of edible fats was stressed by Sir Geoffrey Heyworth recently. He said that edible fats are rapidly growing important in the nutrition of the world population, which is for the most part increasing rapidly. This means the optimum use of land with maximum yield of nutrition units.

Edible fats constitute 78% of the total oils and fats production (animal and vegetable), with only about 13% for soap and 9% for other technical purposes. More fats are added to the diet as the level of prosperity rises and saturation point has not probably been reached anywhere.

In a recent study on the relation between in-come and fat consumption, it has been shown that *per capita* consumption of fat ranges from 7·9 lbs. per annum to 42·7 lbs. from low income levels to highest. During the past century demand per head in western Europe and U. S. has about doubled and population has also doubled, so four times as much fat is now required as in 1850. Increased supplies must now come from edible fats of vegetable origin as the rapidly increasing demand for fats cannot be met from increasing butter supplies. Since 1938 butter production has declined but the manufacture of margarine and similar products increased. World production of butter and ordinary ghee amounts to 3·3 million tons now (excluding Russia) as compared with 30·3 millions in 1938. The increase

in margarine and other similar production is likely to continue despite restrictions on their manufacture in certain countries prompted largely by agricultural interest. This usually takes the form of a colouring prohibition.

All this leads to the supremely important question, the optimum use of land. One aspect of this fundamental question is that large areas of the earth's suffaco are not suitable for the practice of a milk and meat agriculture as the equatorial forest areas of South America, Africa and Southeast Asia. But such areas are for the most part a highly suitable habitat for the invaluable oil palm, the cultivation of which, as one of the world's main sources of fat has to be developed on a large scale. It is interesting to note that the Soya beans according to the U. S. Department of Agriculture, yields 150 pounds of vegetable fat per acre of land as compared with cows 46 lbs. of butter fat. The worlds increasing need for milk and butter and ghee will ensure the dairy farmers' continued prosperity and there is no need to assume that increased production of margarine or similar products will mean reduced needs for butter and dairy products. Chem. and Eng. News 30, 1952 (A. H. S.)

CROP AND TRADE REPORTS

Crop Statistics, 1954—'55, Madras State, Ginger—First forecast: The area under Ginger crop upto 25th August 1954 in the districts of Madurai, Malabar, South Kanara and the Nilgiris is estimated at 12,770 acres. Compared with the area of 12,300 acres estimated for the corresponding period of the last year, it shows an increase of 3·2 per cent. An increase in area is estimated in the districts of Madurai, Malabar, South Kanara and the Nilgiris. The condition of the crop is satisfactory and the yield per acre is expected to be normal in Malabar and South Kanara Districts. The wholesale price of dry ginger per standard maund of 82 2/7 lb. or 3,200 tolas on 4—9—1954 was Rs. 88—8—0 at Kohzikode, Compared with the price for the corresponding period of the last year (i. e. of 5—9—1953) it shows an increase of 82·8 per cent.

Sugarcane Crop: The condition of the sugarcane crop in the Madras State is reported to be satisfactory except in parts of North Arcot where the yield of the crop is expected to be slightly below normal. In Ramanathapuram District, the yield of the crop is reported to be above normal due to favarable rains. It is too early to report on the yield of the crop in Tanjore, Madurai and Tirunelveli. The average wholesale price of jaggery per maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from important market centres on 1—9—'54 was Rs. 14—10—0 in Tiruchirapalli, Rs. 18—8—0 in Cuddalore, Rs. 12—8—0 in Salem, Rs. 11—8—0 in Vellore, Rs. 11—2—0 in Coimbatore and Erode. Compared with the prices published for the corresponding period of the previous year, these prices reveal a fall of 51·2 per cent in Erode, 48·9 per cent in Vellore, 45·8 per cent in Coimbatore 41·5 per cent in Salem, 37·8 per cent in Tiruchirapalli and 35·9 per cent in Cuddalore.

Pepper—First forecast: The area under Pepper upto 25th August 1954, in the districts of Malabar, and the Nilgiris is estimated at 116—610, acres (99,220 acres in Malabar district, 17,240 acres in South Kanara district and 160 acres in Nilgiris district) as against 1,09,400 acres (94,800 acres in Malabar district, 14,500 acres in South Kanara District and 100 acres in the Nilgiris district) estimated for the corresponding period of the last year. The condition of the Pepper crop is

fair. The wholesale price of pepper per maund of 82 2/7 lb. or 3,200 tolas on 4—9—54, was Rs. 129—8—0 for Nadam and Vatakam variety, Rs. 135—3—0 for Wynad variety at Kozikode, Rs. 158—0—0 at Cochin, Rs. 142—2—0 at Tellicharry and Rs. 160—12—0 at Mangalore. Compared with prices in the corresponding period of the previous year i. e. those which prevailed on 5—9—1953, these prices show a fall of 54·1 per cent for Nadam and Vatakkam Variety, 53·1 per cent for Wynad variety in Kozikode, 46·2 per cent in Cochin, 49·3 per cent in Tellicherry and 47·9 per cent in Mangalore.

Mesta—First and Preliminary: The area sown with Mesta (Hibiscus Cannabinus) in the Madras State upto 25th June 1954 is estimated at 1,310 acres. Compared with the area of 1,180 acres estimated for the corresponding period of last year, this is an increase of 11·0 per cent. An increase in area is estimated in the districts of Salem, Coimbatore and Tiruchirapalli and a decrease in the South Arcot district. The area estimated was the same as that of the last year in the districts of Chingleput, North Arcot, Tanjore, Madurai and South Kanara. The area under mesta is little or negligible in the other districts of the State. The yield per acre is expected to be normal in the districts of Coimbatore, Tiruchirapalli, Tanjore, Madurai and South Kanara and slightly below the Normal in other districts of the State. The seasonal factor for the State as a whole works out to 98 per cent of the normal as against 96 per cent of the normal estimated for the corresponding period of previous year. On this basis, the total yield works out to 2,400 bales of 400 lb. of dried fibre as against 2,140 bales of 400 lb. estimated for the previous year, representing an increase of 12·0 per cent.

Gingelly—First Forecast: The area under Gingelly upto 25th July 1954 is estimated at 149,900 acres. Compared with the area of 134,300 acres estimated for the corresponding period of the last year and an average area of 124,300 acres calculated for the past five years, it shows an increase in area this year due mainly to favourable seasonal conditions. An increase in area is estimated in the districts of Chinglepet, North Arcot, Salem, Coimbatore, Ramanathapuram and Tirunelvelly and a decrease in the districts of Tiruchirapalli, Madurai and South Kanara. The area is the same as that of the last year in the districts of South Arcot, Tanjore and Malabar. The acreage under the crop in the Nilgiris district is little or negligible. The increase in acrage is marked in the district of Coimbatore. (* 13,000 acres). The yield per acre is expected to be normal in the districts of South Arcot and Tirunelvelly and it is too early to report on the yield of the crop in the districts of North Arcot, Coimbatore and Ramanathapuram where sowings have just been completed. The wholesale price of Gingelly seed per maund of 82 2/7 lb. (3,200 tolas) as reported from important market centres on 7th August 1954 was Rs. 24—11—0 In Cudalore, Rs. 23—1—0 in Salem, Rs. 26—8—0 in Tiruchirapalli, Rs. 27—8—0 in Tirunelvely, and Rs. 26—8—3 in Tuticorin, Compared with the prices which prevailed on 8th August 1953, these prices show an decrease of 31·4 percent in Cuddalore, 28·3 per cent in Salem, 19·5 per cent in Tiruchirapalli and 26·9 per cent in Tuticurin.

Chillies—First and Final forecast: The area sown with chillies in the Madras State during 1953-54 is estimated at 130,900 acres. Compared with the area of 129,900 acres estimated for the corresponding period of last year and an average area of 121,800 acres calculated for the five years ending with 1951-52. this is an increase of 0·8 per cent and 7·5 per cent respectively. The Seasonal factor for the State as a whole works out to 97 per cent of the normal as against 82 per cent of the normal estimated for the corresponding period of last year. On this basis the total yield for the State as a whole works out to 70,000 tons of dry chillis. Compared with the yield of 57,500 tons of dry chillies estimated for the corresponding period of last year and an average yield of 55,400 tons calculated for

the five years ending with 1951-52, the present estimate shows an increase of 21·7 present and 26·4 per cent respectively. The average wholesale price of chillies per maund of 82 2/7 lb. or 3,200 tolas as reported from important market centres on 13th March 1954, was Rs. 85—6—0 in Coimbatore, Rs. 80—10—0 in Cuddalore, Rs. 78—8—0 in Tiruchirapalli, Rs. 74—12—0 in Tirunelveli, Rs. 73—15—0 in Madurai, Rs. (9—5—0 in Tuticorin and Rs. 67—10—0 in Mangalore. Compared with the prices which prevailed in the corresponding period of last year, these prices reveal an increase of 46·7 per cent in Tirunelveli, 41·3 per cent in Cuddalore, 29 4 per cent in Tuticorin and 3 8 per cent in Mangalore.

Groundnut—Second forecast: Summer Crop: Area and Yield: The area under the Summer crop of groundnut in parts of the Madras State during the five months January to May '54 is estimated at 86,800 acres. Compared with the estimated area of 77,600 acres for the corresponding period of last year and an average area of 78,000 acres calculated for the previous five years ending with 1953-54, the current estimate shows an increase of 11·9 per cent and 11·3 per cent respectively. An increase in area is estimated in the districts of Chingleput, South Arcot, North Arcot, Tiruchirapalli, Madurai and Ramanathapuram and the area estimated is the same as that of last year in the district of Tanjore. The increase in area is mainly due to favourable seasonal conditions at the time of sowings. The yield per acre is expected to be higher than that of last year in all the districts of the State. The toal yield is estimated at 71,900 tons of unshelled nuts as against 58,700 tons of unshelled nuts estimated for the corresponding period of last year representing an increase of 20·4 per cent. Compared with the average yield of 58,100 tons of unshelled nuts calculated for last five years ending with 1953-54 the present estimate shows an increase of 23·8 per cent.

Early Crop: The area under the early crop of ground nut upto 25th July 1954 in the districcts of Salem and Coimbatore is estimated at 1,58,000 acres. Compared with the area of 145,000 acres estimated for the corresponding period of last year and average arerge of 143,000 acres calculated for the last five years ending with 1953-54, it shows an increase of 9·0 per cent and 10·5 per cent respectively. The increase in area is due mainly to favourable seasonal conditions at the time of sowings. The yield per acre is expected to be higher than that of last year in Salem and Coimbatore districts. The total yield in these districts is estimated at 77,400 tons of unshelled nuts. Compared with the estimated production of 68,900 tons of unshelled nuts for the corresponding period of last year and an average yeild of 59,900 tons for the previous 5 years, the present estimate is an increase of 12 3 per cent and 29 2 per cent respectively. The wholesale price of groundnut (machine-shelled) per standard maund of 82 2/7 lb. or 8,200 tolas reported from importent market centers on 7—8—1954 was Rs. 10—6—0 in Cuddalore, Rs. 19—5—0 in Salem, Rs. 18—14—0 in Coimbatore, Rs. 18—10—0 in Tiruppur and Rs. 18—8—0 in Erode. Compared with the prices which prevailed on 8—8—1953, these prices show a decrease of 50 5 per cent in Satem, 46·8 per cent in Erode and 46 6 per cent in Cuddalore.

Weather Review — For the month of September, 1954.

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January
North	Madras (Meenambakkam)	3·5	— 1·2	20·3
	Tirurkuppam*	2·8	— 3·4	22·0
	Vellore	1·1	— 5·8	20·0
	Gudiyatham*	0·4	— 3·5	28·9
East Coast	Palur*	2·9	— 2·1	24·3
	Tindivanam*	1·7	— 3·1	26·8
	Cuddalore	2·6	— 2·6	27·6
	Nagapattinam	1·0	— 2·3	15·6
	Aduturai*	1·2	— 2·3	20·9
	Pattukottai*	2 7	— 0 2	34 8
Central	Salem	1·9	— 4·2	25·8
	Coimbatore (A. M. O.)*	0·4	— 0·9	15·7
	Coimbatore	0·1	— 1·5	17·6
	Tiruchirapalli	3·5	— 0·5	24·3

Division	Station	Total for the month	Departure from normal	Total since 1st January
South	Madurai	3·0	— 1·7	28·8
	Pamban	Nil	— 1·1	12·7
	Koilpatti*	£	— 2·0	21·6
	Palayamcottai	0·1	— 1·1	10·9
	Ambasamudram*	0·7	— 0·6	20·5
West Coast	Trivandrum	4·3	— 0·2	46·2
	Fort Cochin	7·3	— 0·4	104·8
	Kozhikode	7·2	+ 0·6	133·4
	Pattambi*	5·5	— 0·7	81·9
	Taliparamba*	13·0	— 3·8	149·4
	Wynaad*	14·5	— 2·4	82 0
	Nileshwar*	13·6	+ 1·4	171·8
	Pilicode*	15·1	+ 5 2	160 4
	Mangalore	12·9	+ 3·5	142·4
	Kankanady*	14·7	+ 4·2	144·6
Hills	Kodaikanal	0·4	— 6·9	42·0
	Coonoor*	1·2	— 2·3	35·8
	Ootacamund*	1·1	— 3 0	27·3
	Nanjanad*	2·4	— 3·2	48·3

Note:—1. * Meteorological Stations of the Madras Agric. Dept.

2. £ = Actual rainfall is 0·09″.

The month began with a vigorous monsoon in the south and east central Bay. A depression formed in the north Bay of Bengal on 2-9-1954, with its centre about 200 miles south-east of Puri. On the next day it came closer to Puri by 100 miles and on 4-9-1954 it moved away west—northwestwards. Rains were fairly widespread along the West Coast and at a few places elsewhere in the region on 4-9-1954 and 5-9-1954. Conditions continued without any large change till 7-9-1954, when they became unsettled in the north-west Bay of Bengal. Two days hence the monsoon became active along the West Coast, but its vigour abated the very next day and remained so for about five days. On 15-9-1954 the monsoon gained strength along the West Coast and kept its vigour till 24-9-1954. On 25-9-1954 weather became unsettled in the Central and adjoining north Bay of Bengal due to the formation of a depression. A deep depression was noted on 26-9-1954 about 350 miles east of Masulipatam and it intensified into a cyclonic storm on 27-9-1954, about 120 miles south-east of Visakapatnam. The monsoon withdrew from West Rajasthan on 27-9-1954. On 28-9-1954 the Bay cyclone lay over Hyderabad State. Under its influence widespread rains occurred in the Coastal Andhra desa, West Coast and at a few places in Rayalaseema, north Tamilnad and West Mysore. The last two days of the month passed off without any large change. The month ended with practically a dry weather throughout the Madras State.

The note-worthy rainfalls and the zonal rainfall for the month are furnished hereunder :—

Note-worthy Rainfalls for the Month

Date	Name of Place	Rain-fall	Name of Zone	Av. rain-fall for July	Dep. from normal	Remarks
9/9/54	Tiruchirapalli	1·5″	North	2·0	— 3·5	Far below normal
10/9/54	Mathurai	2·0″	East Coast	2·0	— 2 1	do.
17/9/54	Alleppey	3·0″	Central	1·5	— 1·8	do.
do.	Fort Cochin.	1·7″	South	0·8	— 1·3	do.
26/9/54	Madras (Meenambakkam)	1·7″	West Coast	10·8	+ 0·7	Just above normal
			Hills	1·3	— 3·9	Far below normal

Agricultural Meteorology Section,
Lawley Road P. O.,
Coimbatore.

C. B. M. & M. V. J.

DEPARTMENTAL NOTIFICATION

Gazetted Service — Postings and Transfers

Name and Present Post	Posted as
Abraham, P. D., Assistant Cotton Extension Officer, Madurai	Plant Physiologist, Coimbatore.
Appaji, V. K., Superintendent, Sugarcane Liaison Farm	Special District Agricultural Officer.
Francis, T. S., R. D. D., Madurai	Assistant Marketing Officer, Coimbatore.
Gonsalves, S.,	Lecturer in Mechanical Engineering, Coimbatore.
Katchapeswaran, S. S., on leave	R. D. D. Madurai
Krishnaswamy, P. N., Gazetted Assistant to the Cotton Certification Officer, Rajapalayam	Cotton Extension Officer, Madurai.
Muhammad Ali, A. M., Agricultural Engineering Supervisor, Coimbatore	Assistant Agricultural Engineer (Mechanical), Madras.

Upper Subordinates — Postings and Transfers

Name and Present Post	Posted as
Abdul Kadhir, A., A. D. Erode	Plant Production Assistant (Mycology), Tirunelveli.
Balasubramaniam, C. R., Certification Inspector, Rajapalayam	Certification Inspector, Coimbatore.
Balasubramaniam, K R., A. D. D., Velur	Seed Development Assistant Tanjore
Jaleel—Ahammad, N., on leave	Assistant in Mycology, Coimbatore.
John Knight, A. A. D. Wallajah	A. A. D., Ambur
Kalyanikutty, T., Paddy Assistant, Pattambi	Paddy Assistant, Coimbatore.
Kuppuswamy, V. R., Seed Development Asst.	Tanjore A. A. D. Velur (Salem)
Kuttisankaran, M. P., Adl. F. M., Kulittalai	A. D. Coondapoor.

Name and Present Post	Posted as
Laxmi, A., Assistant in Mycology, Coimbatore	Assistant in Entomology, Cbe.
Mohammad Ibrahim, P. A., Coconut Nursery Assistant, Marudur	Assistant in Oilseeds, Pilicode.
Natarajan, C. P., Assistant in Chemistry	Assistant in Chemistry, Coimbatore
Paramanandam, P., Spl. A. D., Sugarcane, Karur	A. D , Namakkal.
Padmanaban, S. Soil Conservation Assistant, Kangayam Vellakoil Scheme	Soil Conservation Assistant, Dharapuram
Pattabiraman, R., Spl. A. D. Sugarcane Act, Karur	A. A. D. Erode.
Rajagopal Reddy, V., on leave	Paddy Assistant, Pattukottai.
Sankaranarayanan, C. Farm Manager, Cbe.	Seed Development Assistant Cbe.
Santhanam, S. R., Soil Conservation, Assistant, Kangayam, Vellakoil Scheme	Seed Development Assistant, Cbe.
Seshagiri Rao, T., Assistant in Chemistry, (Salem)	Assistant in Chemistry, Cbe.
Singaravelu, T. V., A. A. D , Gangavalli	Spl. A. D., Sugarcane, Karur.
Sriyan Kumar, S., Paddy Assistant, Palur	A. D. Kallakurichi
Sundaram Pillai, K., Plant Protection Asst. Mycology, Tirunelveli	A. D. Erode
Thyagarajan, S. R , Asst. in Chemistry, Cbe.	Asst. in Mycology, Coimbatore.
Venkatram, C. N., Asst.n in Ckemistry, Cbe.	Field Assistant in Chemistry.
Vittal Higdi, Y., A. D., Coondapoor	Addl. F.M., Kulitalai, Trichi Dt.

NEWS AND NOTES

Under the auspices of the Students' Club, Mr. Kenneth Farner from Idaho, U. S. A. who was at the Agriculture College, Coimbatore on the Agricultural "4 H" programme, gave a talk to the students and staff on October 20th 1954 on American Farming and his impressions of India.

The College participated in the Intercoligate zonal debates in English, Tamil, Malayalam and Kannada held at the Arts College, Salem; the Arts College, Coimbatore; Victoria College, Palghat, and at the Arts College, Mangalore, respectively.

The following students represented the College in the debates:

Mr. Sundaravaradan, Final year ,, William Odango do.	English.
Mr. R. M. Alagappan, Final year ,, Raja Sheriff, Second year	Tamil.
Mr. V. Kumaran, Final year ,, Narayana Pishoroti Final year	Malayalam.
Mr. B. Karunakara Shetty, Final year ,, Krishna Marla, Second year	Kannada.

The candidates failed to get selected for the final debate.